SELF-EFFICACY AS A PREDICTOR OF REGIMEN ADHERENCE IN SELF-CARE
OF NON-INSULIN DEPENDENT DIABETES MELLITUS

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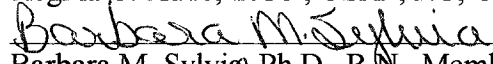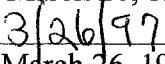Regina C. Aune, LtCol, USAF, NC, Chair   March 26, 1997
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Report Documentation Page		*Form Approved* *OMB No. 0704-0188*

1. REPORT DATE **1997**	2. REPORT TYPE	3. DATES COVERED **-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Self-Efficacy as a Predictor of Regimen Adherence in Self-Care of Non-Insulin Dependent Diabetes Mellitus	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Uniformed Services University of the Health Sciences (USUHS),4301 Jones Bridge Road,Bethesda,MD,20814-4799**	8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
see report

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES **69**	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**			

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

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ABSTRACT

Self-Care is the most critical component of the non-insulin dependent diabetic's treatment regimen. The purpose of this descriptive study was to determine the extent of perceived self-efficacy and to examine the relationship between perceived self-efficacy and demographic, disease-related, and behavior-related regimen variables. Data were collected from a convenience sample of individuals who participated in the diabetes education program at a major military medical center and consisted of answers to a self-administered questionnaire which included questions about demographic characteristics, disease-related characteristics, and behavior related to diabetes regimen adherence. The questionnaire also included the Diabetes Self-Efficacy Scale, a 21 item Likert-type tool developed specifically to measure self-efficacy in diabetics. Data were collected from 27 participants over a two month period and were analyzed and reported using descriptive statistics. Of the 27 participants, 11 reported that they had developed at least one complication that was directly related to the diabetes disease process. Self-efficacy in the complications group was found to be markedly lower than that of the noncomplication subsample. This is consistent with self-efficacy theory. While the study did not definitively answer the questions it set out to due to small sample size and over-reliance on self-reporting, the results support the value of further investigation.

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OF NON-INSULIN DEPENDENT DIABETES MELLITUS

by

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THESIS

Presented to the Graduate School of Nursing Faculty of

the Uniformed Services University of the Health Sciences

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF SCIENCE DEGREE

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

May 1997

DEDICATION

I dedicate the creation of this thesis to my family. To my precious daughter, Erin, your humor and wisdom are a constant source of amazement and inspiration to me. And to my parents, Peggy and Lee Abbott. Thank you for your unwavering love and support. You bring me through the hardest of times.

ACKNOWLEDGMENT

The Assistance, guidance and support of numerous people have contributed to making possible the attainment of this degree. I am especially grateful to LtCol Regina Aune, chairperson, and the members of my thesis advisory committee, Dr. Barbara Sylvia and Dr. Eugene Levine. Their guidance, knowledge and support was invaluable.

Grateful appreciation is extended to Nancy Hall, R.N., M.S.N., C.D.E. without whose assistance, this study would not have been possible.

I would also like to acknowledge the assistance of Dr. Katherine Crabtree who gave me permission to use her tool, the Diabetes Self-Efficacy Scale.

Finally, appreciation is extended to my classmates who generously shared ideas, information and insights throughout the research process.

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CHAPTER ONE

The Diabetes Control and Complications Trial (DCCT) demonstrated that near

normalization of blood glucose levels in persons with Insulin Dependent Diabetes

Mellitus (IDDM) resulted in significant decreases in the development of long-term

complications, such as retinopathy, neuropathy and nephropathy, that are commonly

associated with this disease (The DCCT Research Group, 1993). While this clinical trial

was restricted to participants with IDDM, it is widely believed that the benefits of blood

glucose control can also be enjoyed by individuals with Non-Insulin Dependent Diabetes

(NIDDM) as well (Santiago, 1993). The implications of these findings are significant for

several reasons. Approximately 6.8 million people in the United States (three percent of

the population) have been diagnosed with diabetes and it is estimated that an additional

7.2 million cases remain undiagnosed (U.S. Dept. of Heath and Human Services, 1993).

The majority of individuals with diabetes have the Non-Insulin Dependent form of the

disease (formerly known as Adult Onset or Type II Diabetes) which responds well to

lifestyle modification.

Diabetes is the seventh leading cause of visits to primary care physicians (Kerr,

1995) and the cost of treating diabetes in the Unites States is approximately $20 billion

per year (American Diabetes Association, 1991). The complications of diabetes continue

to be the primary cause of adult onset blindness, end stage renal failure and non-

traumatic lower extremity amputation (U. S. Dept. of Health and Human Services, 1991).

Diabetes is also a significant risk factor for the development of other chronic conditions,

such as ischemic heart disease and stroke, and a major contributor to disability,

premature mortality and health-care costs among working-age adults (U.S. Department of Health and Human Services, 1993). Diabetes was identified as the underlying cause of death for 48,259 people in 1992 and was a contributory cause of death in 118,678 cases that year (American Diabetes Association, 1993a).

The DCCT clearly demonstrated that the complications which commonly lead to disability and death among diabetics could be prevented, or their progression halted, with the achievement of optimal blood glucose control (DCCT Research Group, 1993). In fact, among non-insulin dependent diabetics, the achievement of blood glucose control through lifestyle modification often results in the reduction or elimination of medication needed to control the disease. While these benefits are attainable, the DCCT Research Group recognized that doing so was difficult for most diabetics, and strongly recognized the critical need for effective diabetes education (DCCT Research Group, 1993). In the past, interventions to promote effective self-management activities by diabetics have not been systematic, individualized or particularly effective (Hiss, Anderson, Hess, Stephen & Davis, 1994). However, as healthcare costs and limitations increase, effective interventions for patients with diabetes will become imperative, especially in the area of education (Quackenbush, Brown & Duchin, 1996).

While unique in many ways, the military healthcare system struggles with many of the same limitations as its counterpart in the private sector. Military healthcare is increasingly subject to fiscal limitations and must continually reassess its priorities for the services that can be provided. While several of the major military medical centers have formal diabetes education programs, the majority of facilities do not enjoy this

luxury. In many instances, diabetes education is provided by an informal team that provide their services as an additional duty. In many cases, these providers are not trained specifically in diabetes education and are not certified diabetes educators. On the other hand, the population served by military healthcare is representative of what is found in the private sector in that they experience the same risk for developing complications as their non-military counterparts. When these risks are not addressed, the resulting costs - both human and financial - become an additional drain on the military budget. In reality, the costs accrued with the development of avoidable diabetes complications are probably more than enough to fund state-of-the-art diabetes education programs.

Self-care is a critical component of the diabetic's treatment regimen. Maintenance of optimal blood glucose levels requires a complex balance in behaviors concerning diet, exercise, medication and monitoring activities. In most instances, these important activities are performed at home, away from the direct guidance of a health care provider, and require knowledge and decision-making skills on the part of the diabetic. While activities such as medication and monitoring are largely technical in nature and are largely dependent upon physical skills and cognition, success in managing diet and exercise relies on changing firmly entrenched (often lifelong) habits with strong personal and cultural components. Changes in these behaviors require tremendous adjustments that impact all areas of the diabetic's life, and often infringe on relationships with friends and family as well. In order to successfully manage diabetes, the individual must also understand the disease process and the rationale and mechanisms of the

treatment components, and must be able to estimate the effect that a change in one sphere has on another. In addition to the cognitive and social demands of the diabetes regimen, the individual must also be able to manage the physical demands of treatment at a time when eyesight, dexterity and stamina may be declining. For example, both fine motor skills and visual acuity impact the ability to successfully self-monitor blood glucose. The individual must be able to pierce the fingertip with a lancet, form a hanging droplet of blood by "milking" the finger, and touch the drop of blood to a specific area of the test strip without smearing the blood or touching the strip with the finger itself. Following this, the process must be accurately timed with a wristwatch or a blood glucose meter, and the results recorded and interpreted. For many, the demands of these requirements become overwhelming. Unless ongoing assistance in the form of an individualized educational program is available, patients are likely to abandon their role as an active participant in the management of their disease. When this occurs, achievement of blood glucose control is unlikely and the risk of developing of complications increases. Although traditional patient education has been somewhat effective in teaching patients about the technical aspects of diabetes management, it has not led to consistent or enduring behavior changes necessary for long-term blood glucose control and decreased morbidity (Quackenbush, Brown & Duchin, 1996).

For these reasons, the nature of diabetes education has undergone a change in recent years and attention to the psychological and social aspects of management have rightfully become an important part of planning effective diabetes education programs. Although many promising models are currently receiving attention, this study focused on

the concept of self-efficacy, a derivative of social learning theory. According to Bandura (1989, p. 472), self-efficacy is concerned with:

> people's belief in their capabilities to mobilize the motivation, cognitive resources and course of action needed to exercise control over given events . . . People tend to avoid activities and situations they believe exceed their coping capabilities, but they readily undertake activities and select social environments they judge themselves capable of handling.

When applied to management of the diabetes regimen, this model postulates that if individuals receive education and training which fosters belief in their ability to successfully master the components of the regimen, they will be more likely to participate in the activities and situations necessary to manage the disease.

Research Questions

The purpose of this study is to determine the extent of perceived self-efficacy and to examine the relationship between perceived self-efficacy and demographic, disease-related, and behavior-related regimen variables. The research questions guiding this study are as follows:

1. What is the overall self-efficacy of the population addressed in this study?

2. What is the relationship between self-efficacy and demographic factors such as age, sex, marital status and education?

3. What is the relationship between self-efficacy and disease related factors such as duration of disease, self-reported presence of complications.

4. What is the relationship between self-efficacy and blood glucose levels using diagnostic tests such as Hemoglobin A1C (Hgb A1C) or a current fasting blood sugar (FBS)?

5. What is the relationship between self-efficacy and behavior-dependent aspects of regimen adherence such as diet, exercise, medication and general management of diabetes?

Conceptual Framework

Self-efficacy is a sense of "I can do." Self-Efficacy Theory grew out of Social Learning Theory in the late 1970s. Albert Bandura, largely credited with developing the theory, described self-efficacy as the link between knowing what to do and actually doing it. In other words, the beliefs of individuals in their ability to perform a specific behavior directly influences the choice of behaviors they participate in or avoid, the effort they expend toward completing a specific task, how long they persist with the task, and their emotional reactions to the threat of failure (Bandura, 1977). Further, knowing what to do and believing in the ability to succeed must be supplemented by the knowledge necessary to complete the task (skills) and the desire to do it (incentive) (Johnson, 1996).

Bandura identified several sources of self-efficacy. Performance accomplishments point to the individual's ability to perform a specific task as an indicator of their willingness to do it. An example of performance ability is the ability of individuals to perform return demonstrations of a skill such as blood glucose monitoring. Successful accomplishment of the behavior indicates the likelihood of eventual mastery of it (Bandura, 1977). Performance ability is strongly influenced by enactive

attainment, a composite of past accomplishments. This is the most influential determinant of efficacy because it is based on the individual's own mastery experiences (Bandura, Adams & Beyer, 1977). Vicarious experience is learning that occurs as a result of observing others performing specific activities - a comparison of self to an observed experience (Bandura, 1986). While a less dependable indicator of mastery than performance activity, vicarious experience tends to enhance expectations of the successful completion of a task. Verbal persuasion is the process of convincing an individual of his or her ability to perform a task simply by telling them that they can. As expected, efficacy expectations produced by verbal persuasion are weaker than those stimulated by performance accomplishment and vicarious experience but it can contribute to successful performance when it is realistic (Bandura, 1977). The implications for diabetes education are clear: programs that rely on a single source of self-efficacy (such as a videotape) are likely to produce weaker feelings of self-efficacy than those that use a combination of methods (lecture with return demonstration and individualized follow-up, for example).

Bandura (1977) also noted that anxiety or stress adversely affects self-efficacy and weakens performance, which underlines the importance of assessing the individual's learning style and implementing educational methods that are congruent with it. According to Self-Efficacy Theory, knowledge is necessary, but alone, it is an insufficient predictor of behavior. Knowledge, outcome expectations, and incentive to action collectively determine the behavior that follows and leads to the outcome. Outcome expectations, or the belief that outcomes are determined either by one's actions

or by forces beyond one's control, appear to be highly dependent on self-efficacy to enact behavior (Glasgow, Toobert, Riddle, Donnelly & Calder, 1989).

To summarize, performance accomplishment, vicarious experience, verbal persuasion and psychological state are antecedents that form various combinations which contribute to the development of self-efficacy beliefs. Self-efficacy leads to a behavior which, in turn, results in an outcome. A final important aspect of the process is the presence or absence of an action incentive. No matter how capable an individual is of performing a behavior, motivation is required to invoke self-efficacy (Bandura, 1986).

One of the most significant aspects of Self-Efficacy Theory is its predictive capability. By determining how an individual perceives his or her ability to perform a task, it is possible to predict the likelihood that the task will be successfully completed (Johnson, 1996). This has enormous implications for the diabetes education process because the insight provided by the theory provides the guidance necessary to individualize the process, to identify individual strengths and weaknesses, to meet each person's specific needs, and to monitor ongoing progress. Because self-efficacy is related to specific behavioral tasks, it is possible to modify separate components of the education process as needed. For example, if an individual is consistently taking medication and monitoring blood glucose, but is experiencing difficulty with the dietary aspect of the regimen, the focus of the education process could be shifted to address the area of weakness. As is implied, judgments of self-efficacy are not generalized, but vary in the presence of specific settings (Cervone & Peake, 1986). Therefore, scales that measure self-efficacy should be performance specific. According to Bandura (1992),

high levels of perceived self-efficacy are accompanied by higher performance attainments, exerting a near-causal influence on individual mastery. At the same time, external elements, such as social comparison with others, directly influence self-efficacy beliefs in positive or negative ways. For this reason, self- efficacy must be viewed as a fluid or unstable process and interventions based on this theory must be individualized and ongoing.

<div align="center">Definitions and Variables</div>

<u>Self-Efficacy</u>

An individual's sense of mastery over a task or situation.

<u>Non-Insulin Dependent Diabetes Mellitus</u>

For the purpose of this study, the population consisted of individuals who have been diagnosed with Non-Insulin Dependent Diabetes Mellitus (NIDDM). According to the American Association of Diabetes Educators (1993), individuals with NIDDM are not dependent on exogenous insulin, nor are they prone to ketosis. Typically, patients have the onset of their condition after age 40, have a family history of diabetes, are obese and, in many cases, have glucose intolerance that is improved with weight loss.

<u>Hemoglobin A1C or glyccated hemoglobin</u>

A non-fasting blood test that measures glycosylated hemoglobin. In conditions of sustained hyperglycemia, the proportion of the hemoglobin that is glycosylated increases significantly and reflects the glycemic control of a patient during a 6 to 8 week period prior to when the sample was drawn and correlate well with fasting and postprandial blood glucose values. Acceptable Hgb A1C levels range from approximately 6 to 8

(Kahn and Weir, 1994). A high percentage indicates poor control; a low percentage

signals good control (American Diabetes Association, 1996).

<u>Fasting Blood Glucose</u>

A measure of glucose in a peripheral blood sample following the withdrawal of food and

calorie-containing drink for approximately 8 hours prior to the test. Non-diabetic levels

range from 70 to 110 mg/dL. Individuals with diabetes are encouraged to maintain levels

from 100 to 150 mg/dL (Watson & Jaffe, (1995).

<u>Demographic Factors</u>

Factors that describe the sample. For this study, these factors included military status,

age, gender, number of years of education and marital status.

<u>Disease Related Factors</u>

Factors that help characterize the individual's physical experience with NIDDM, such as

the duration of the disease in years, self-reported increased fasting blood glucose and/or

Hemoglobin A1C and the presence or absence of self-reported complications.

<u>Behavior Related Factors</u>

Factors that provide insight about the individual's participation in managing the diabetes

regimen, such as adherence to a recommended diet and exercise plan, regular foot

checks,

and routine self-monitoring of blood glucose at home.

Limitations

Subjects for this study were obtained from only one site and participated in one diabetes education program taught by one diabetes educator. This limits the ability to generalize the findings.

CHAPTER TWO

Literature Review

Diabetes mellitus is a clinical syndrome characterized by inappropriate

hyperglycemia caused by a deficiency of insulin or by resistance to the action of insulin

(Ratner, 1992). It is an extremely common condition among the elderly, affecting an

estimated fifteen to twenty percent of the population over age sixty-five (Harris, 1990;

Messana & Beizer, 1991) and perhaps as many as 200 million worldwide (Ratner, 1992).

Each year more than 650,000 new cases are identified (U. S. Dept. of Health and Human

Services, 1993). Diabetics consume a disproportionate share of the health care system:

approximately three percent of all outpatient visits involve a diagnosis of diabetes

(Ratner, 1992). In 1990, there were 2.8 million diabetes-related hospital discharges

(discharges listing diabetes as one of the discharge diagnoses), accounting for 2.4 million

hospital-stay days. That same year, diabetes was listed as a primary discharge diagnosis

in approximately 420,000 hospital discharges with an average length of stay (LOS) of 7.8

days (U. S. Dept. of Health and Human Services, 1993b). The direct cost for diabetes is

considerably higher for diabetes than for other diseases, ranging from $9.6 billion to

$13.7 billion per year. Direct medical costs for diabetes consist of 43% of the total costs,

compared to 22% for cancer, 27% for circulatory disease and 11% for musculoskeletal

disease (Ratner, 1992).

Diabetes is subclassified into several broad categories including the three most

commonly occurring types: Type I, Type II and Gestational Diabetes. Type I (insulin-

dependent diabetes mellitus or IDDM) is an autoimmune disease which attacks the beta

cells of the pancreas and destroys its ability to produce insulin. This disease is most commonly diagnosed in individuals under the age of twenty-five and results in a life-long dependence on injected exogenous insulin for survival. Type II (noninsulin-dependent diabetes mellitus or NIDDM) is characterized by a decreased insulin secretory response to glucose, by reduced sensitivity to insulin at the insulin receptors and by post receptor defects (Galloway, 1989). Type II diabetics are not dependent on exogenous insulin for survival although many use it to improve blood glucose control. Major risk factors for the development of NIDDM include a family history of the disease, obesity, decreased physical activity (i.e. a sedentary lifestyle) and age. In addition, the presence of co-existing diseases and the use of various drugs may contribute to hyperglycemia (Lebovitz, 1994). Unlike Type I diabetes, NIDDM is associated with a gradual onset in mid- to late-adulthood. This form of diabetes becomes increasingly common with age and is almost ten times as common among those over age 65 as those under age 44 (Funnel & Merritt, 1992). Because the general population is aging, it can be anticipated that the prevalence of Type II diabetes will increase dramatically. While currently 11% of the population is over age 65, it is anticipated that this number will increase to over 20% by the year 2000 (Funnel & Merritt, 1992).

Diabetes is associated with both acute and chronic complications. In Type II diabetes, acute complications include hyperglycemia, hyperosmolar nonketotic coma, and infection. In the Type II population, chronic conditions are more commonly seen and are associated with increased morbidity and mortality due to their tissue-damaging effects. The chronic complications of diabetes are generally classifiable as

microvascular and macrovascular and are often clinically manifested after years of disease duration (usually more than ten years) (Lebovitz, 1994). Microvascular means small blood vessel and these complications affect three organ systems: the eyes (retinopathy), the kidneys (nephropathy) and the nerves (neuropathy). Microvascular complications lead to visual loss (retinopathy), kidney failure (nephropathy) and neurological symptoms such as pain, burning and loss of sensation, usually in the lower extremities. The term "microvascular" stems from traditional terminology and does not imply that these complications result from small vessel disease (American Diabetes Association, 1996). Diabetic nephropathy is the most common cause of end-stage renal failure (ESRF) and occurs in approximately five to ten percent of Type II diabetics in the general population, and at higher rates among groups with an increased prevalence of NIDDM such as African Americans and Native Americans. This condition is responsible for approximately 30% of all new patients entering ESRF treatment programs and although interventions such as dialysis and transplantation are available, five year survival approaches only 20% (Defronzo, 1994). Approximately 500,000 Americans have diabetic macular edema and an additional 700,000 have proliferative diabetic retinopathy, the most threatening form of the disease. About 8,000 new cases of blindness each year are directly related to complications of diabetes. Diabetic retinopathy is often asymptomatic in its most treatable phase and early detection and treatment are critical. The treatment of choice for existing retinopathy is laser photocoagulation which can reduce the risk of severe visual loss by 60% if initiated in a timely manner (Aiello & Cavallerano, 1994). Macrovascular complications stem from

atherosclerosis of the large blood vessels and lead to conditions such as angina, heart attacks, strokes and amputations (American Diabetes Association, 1996). The combination of neuropathy, vascular insufficiency and an altered response to infection increase the diabetics' risk of lower limb disorders dramatically. Minor trauma is frequently the precipitating event for serious diabetic foot problems. Most major non-traumatic amputations in this country are performed on diabetic patients (Gibbons & LoGerfo, 1996). To summarize, "diabetes and its complications shorten life-span, limit normal daily activities, create disability, increase use of healthcare services, and impose economic burden on persons who have disabilities" (U. S. Dept. of Health and Human Services, 1993, p. 4).

For many years it was suspected that improved glycemic control improved the health status of diabetics and limited the development of complications but there was no evidence that this was so until the findings of the Diabetes Control and Complications Trial (DCCT) were released in 1993. This ten year project studied approximately 1,500 Type I diabetics at 29 sites across the country in an effort to determine whether "tight" glucose control reduced development and/or progression of diabetic retinopathy, neuropathy and nephropathy. A control group was treated in the traditional manner while the experimental group was supported in their efforts to maintain improved control (the average FBS in the experimental group was approximately 150 mg/dL). The experimental group received ongoing education and support with an emphasis on self monitoring of blood glucose, dietary and exercise management and more frequent insulin injection to mimic the action of the pancreas. The patients were fully involved in

the management of their disease and were the primary decision makers. The results were astounding. Although normalization of blood glucose was not achieved in the intensively treated cohort, there was an approximate 60% reduction in risk in diabetic retinopathy, nephropathy and neuropathy. The benefit of improved (if not normalized) blood glucose resulted in a delay in the onset and a major slowing of the progression the three complications studied (The DCCT Research Team, 1993). Needless to say, the results of the DCCT revolutionized the management of diabetes mellitus.

Although Type II diabetes was not studied in the DCCT, there is every reason to believe that non-insulin dependent diabetics can enjoy the same benefits with improved glucose control. Eye, kidney and nerve abnormalities are similar in both Type I and Type II diabetes and it is likely that the same or similar underlying mechanisms of disease are in place (American Diabetes Association, 1996). Since the DCCT findings were released, a number of similar studies focusing on Type II diabetes have been initiated. Studies are underway in a number of Veterans Affairs sites and recent findings have demonstrated the feasibility of achieving excellent control of blood glucose among non-insulin dependent diabetics using intensive insulin therapy. At the three year mark, Hgb A1C levels have declined by two percent from 9.1 to 7.3 without excessive weight gain or hypoglycemia (Abraira, Colwell, Nuttall, Sawin, Nagel & Comstock, 1995). In a prospective study of Type II Japanese diabetics, good glycemic control was achieved over a six year period with multiple insulin injections, resulting in a delay in the expected onset of complications and a slowing in their progression (Ohkubo, Kishikawa, Araki, Miyata, Isami & Motoyoshi, 1995).

Finally, The Wisconsin Epidemiological Study of Diabetic Retinopathy demonstrated a strong relationship between elevated Hgb A1C levels and retinopathy among Type II patients (Klein, Klein & Moss, 1995). Given the large numbers of Type II diabetics compared to those with Type I, it is reasonable that the interest in the effect of improved glycemic control on the development of complications will continue to grow. Hopefully, the studies will begin to focus on ways to achieve these ends without a heavy reliance on exogenous insulin. With lifestyle modification, Type II diabetics are capable of managing their blood glucose levels with diet and exercise alone, or with one of a growing number of oral agents. Insulin should not be considered first line therapy in Type II diabetes primarily because it tends to promote weight gain, which in turn increases insulin resistance. An additional consideration is the increased vulnerability among some elderly Type II diabetics to the serious consequences of hypoglycemia (fainting, seizures, falls, stroke, silent ischemia, heart attack, or sudden death). Advanced age or significant comorbidity must be a consideration when setting blood glucose goals in non-insulin dependent diabetics (American Diabetes Association, 1996).

The DCCT has demonstrated that education is a critical element in motivating patients to achieve glycemic goals and diabetes teaching programs have been shown to be cost-effective interventions (Baliga & Fonseca, 1997). The DCCT has also shown that often the health care provider must change as much as the patient for interventions to be successful. Each member of the diabetes education team - the provider, the educator, the nutritionist, the pharmacist, etc. - must shift toward a collaborative style of interactions. Patients have proven that they will not make multiple changes in their lifestyle just

because they are told, and sometimes prescribing or demanding change builds a wall between the healthcare team and the patient. Also, it must be recognized by everyone concerned that achieving and maintaining glycemic control is a labor-intensive process which will not succeed when interactions are limited and brief (Lorenz, Bubb, Davis, Jacobson, Jannasch, Kramer, Lipps & Schlundt, 1996).

The multifaceted nature of the treatment regimen and its invasiveness into personal and cultural areas of value make motivation and adherance on the part of the Type II diabetic difficult. Social Learning Theory has been utilized extensively as a predictor of regimen adherence among persons with diabetes. McCaul, Glasgow and Schafer (1987) used it in a study of 84 adult and 23 adolescent insulin-dependent diabetics. The study demonstrated that perceptions of self-efficacy were significantly predictive of adherance especially in variables of insulin administration and glucose testing. Working with Bandura on her doctoral research, Crabtree used the theory to investigate factors that influenced self-care behavior in a sample of 143 individuals with IDDM and NIDDM. After controlling for the effects of variables such as age, sex, marital status, duration of disease and severity, perceived self-efficacy was found to explain 25% to 33% of the variance in diet, exercise and general diabetes self care. Also of note, during the course of this study, a self-efficacy scale specific to diabetes was developed and utilized (Skelly, Marshall, Haughey, Davis & Dunford, 1995).

More recently, a study examined the extent to which perceived self-efficacy and confidence in outcomes affected adherence to a diabetes regimen of home glucose testing, medication/insulin administration, diet and exercise at two points of time among

a sample of 118 inner-city African American women with NIDDM. Bivariate and multivariate analysis at times one and two demonstrated the ability of self-efficacy alone to explain diet, exercise and home glucose testing behaviors (Skelly, Marshall, Haughey, Davis, and Dunford, 1995). Interestingly, the findings of this study suggests that while self-efficacy appears to be associated with specific adherence behaviors at a particular point in time, it cannot be relied upon as a predictor of stability in that same behavior later in time. This is consistent with Bandura's concept of various antecedents of self-efficacy which suggest that extraneous variables such as stress or anxiety, impact on the degree to which an individual perceives self-efficacy. It also supports the need for an ongoing education process that addresses changes in circumstances and provides for the necessary individualized follow-up.

Using the Diabetes Self-Efficacy Scale (DSES) developed by Crabtree and Bandura, Padgett (1991) applied self-efficacy theory in a cross-cultural study set in an outpatient clinic in Zagreb, Yugoslavia. One hundred forty seven individuals with NIDDM were surveyed concerning demographic characteristics, depressive symptoms, self- and physician-rated adherence to a diabetic regimen and diabetes self-efficacy. Information about disease-related factors (Hgb A1C, disease duration, and the presence of complications) was assessed by chart review. Correlational analysis revealed a significant link between self-efficacy beliefs and adherence behaviors and a weaker relationship between these variables and the indicator of glycemic control, the Hgb A1C. While this might appear to be counterintuitive at first glance, it is important to consider that changes in health-related behaviors have not invariably resulted in improvements in

health status. Padgett (1991) cautions that findings from this study demonstrate that practitioners cannot necessarily expect immediate improvements in glycemic control, but should continue to monitor the complex array of factors in an ongoing manner.

None of the published works reviewed for this study focused on a military population. The samples in the above studies were constrained by situational limitations in financial or physical access to care in varying degrees. The military population provides an opportunity to study individuals with minimal barriers to care and a reliable source of income that, in theory, allows them to pursue activities that will maximize their health status. In addition, the population currently served by military medical centers is generally representative of their civilian counterparts in terms of age, gender, race and other risk factors for the development of diabetes and its associated complications. The study of this population provides an opportunity to examine the impact of self-efficacy theory on diabetes management and disease process with a minimalization of barriers.

CHAPTER THREE

This chapter describes measures taken to protect the human rights of the patients who participated in the study by completing a questionnaire. It also describes the development of the content of the questionnaire and the sample. The instrumentation section includes details of the demographic information to be collected and a physical description of the Diabetes Self-Efficacy Scale (DSES).

Human Rights

Written permission for this study was first obtained from the Director of Medical Education at the proposed study site. A copy of the proposal was submitted and written approval was then obtained from the Institutional Review Board, Research Administration at Uniformed Services University of Health Sciences.

Steps were taken to protect the rights of the patients who completed the questionnaire by eliminating any identifying data. The questionnaires were distributed and collected by a third party who was not directly involved in the study. No personal contact occurred between the investigator and the participants. Data from the questionnaires was compiled in aggregate form.

Sampling

The data were gathered from a convenience sample of participants in the diabetes education program at a major military medical center over a two month period (January and February of 1997). Eligibility for care at military facility is currently extended to active duty military personnel and their families and to retired military personnel and their spouses. Most services, including in- and out-patient services,

pharmacy and educational programs, are provided at no cost to the patient. A monthly series of multi-disciplinary diabetes education classes are available to patients and their family members by provider or self-referral. Questionnaires were distributed to class attendees at the beginning of the session on three occasions over the two month period. Thirty-four individuals participated in the diabetes education classes during the time the study was taking place, and twenty-seven completed questionnaires were returned. In order to participate in the study, individuals must have received a medical diagnosis of non-insulin dependent diabetes mellitus. Individuals were excluded from the study if they were unable to read or write or had severe vision deficits.

<div align="center">Instrumentation</div>

Participation in this study consisted of the completion of a questionnaire that included the Diabetes Self-Efficay Scale (DSES), a 21 item instrument with a Likert-type response format (See Appendix A). The response to each question was on a five point scale ranging from "1", "strongly agree" to "5", "strongly disagree". This scale was designed to assess the participants' beliefs in ther ability to engage in the necessary activities to control their diabetes. The instrument consisted of four subscales: diet (eight items), exercise (six items), general management of diabetes (four items) and medication (three items). The DSES was originally constructed by Crabtree, with advice from Dr. Bandura, for her unpublished doctoral dissertation in 1986. At the time of its development, the scale was tested on a sample of 143 patients at a University of California diabetes clinic. Tests of the reliability of the DSES yielded adequate internal consistency coefficients for the total scale (standardized alpha = 0.71) and for the diet

subscale (standardized alpha = 0.77). The original scale also contained a subscale which addressed medication-taking but it was excluded from subsequent studies due to the modest alpha reliability (0.65) and the wide variability in medication-taking regimens among individuals with non-insulin dependent diabetes (Padgett, 1991). For the purpose of this study, an attempt was made to re-examine medication-taking with the addition of three questions to the original DSES scale which focus on this aspect of the diabetes regimen.

The questionnaire obtained information on demographic variables such as military duty status (active duty, retired, dependent), age, gender, years of education and marital status. General information about disease status was obtained by asking for the number of years since the diagnosis of Type II diabetes and by requesting that the participant record the latest fasting blood sugar and Hgb A1C, if known. The presence of diabetes complications was ascertained by self-reporting of visual changes related to diabetes (retinopathy), changes of sensation in extremities (neuropathy), slow-healing sores on feet or legs (neuropathy and vascular changes) and changes in kidneys due to diabetes (nephropathy). A positive response to any of these self-reported categories was considered positive for diabetic complications. Insight about the person's adherance to a diabetes regimen was gathered by asking for a yes/no response to questions about diet, exercise, blood glucose monitoring, and foot checks. A "yes" response to a question indicated adherance to that particular aspect of the diabetes regimen.

Prior to the study, two diabetes experts reviewed the questionnaire to provide evidence for content validity. Both individuals are Certified Diabetes Educators and both

currently work actively in educational capacities with diabetic patients in military facilities. Both individuals are Master's prepared: one in nursing, one in nutrition. Each expert received an instruction and evaluation sheet and a copy of the questionnaire, and evaluated the relevance of each element using a scale of one (not at all relevant) to four (very relevant).

Two items received scores of two by both experts: military status and number of years of education. Since these items reflected general demographic information, rather than disease-specific information, a decision was made to retain them. The only item that received a two point difference between raters was that which requested fasting blood sugar and Hgb A1C values. One rater found these items somewhat relevant (3) and the other felt that they were very relevant (4). Again, a decision was made to retain the item with the rationale that the information elicited by it would provide insight as to overall diabetes control. The experts either agreed on the remainder of the items or were no more than one point apart. The content validity index was calculated at .98. No items on the questionnare were changed or eliminated as a result of the review of content validity.

Upon completion of the data collection process, the demographic, disease and regimen-related information and the DSES results were coded and entered into the computer. Seven items (5, 10, 12, 15, 18, 20 21) in the DSES had been written in a "reverse" format to decrease response set bias and these were recoded so they would be consistent with the rest of the scale. Scores for each element were analyzed by calculating frequency and percentage of responses using the SPSS Software Program.

CHAPTER FOUR

This chapter presents demographic data on the 27 study participants who completed questionnaires. It also provides data on their disease status according to duration of disease in years, self-reported fasting blood sugar and Hgb. A1C values, and the presence of self-reported complications such as retinopathy, neuropathy, vascular changes and nephropathy. Diabetes regimen adherence is estimated by participants' response to questions about diet, exercise, foot care and self-monitoring of blood glucose behaviors. Finally, responses to the Diabetes Self-Efficacy Scale and each of its subscales is described.

Of the twenty-seven participants, three (11.1%) were active duty military members (all males). Eight of the participants (29.6%) were retired from military service (all males), and sixteen (59.3%) (all females) were dependents of active duty or retired military personnel.

The mean age of the participants was 59 years with a standard deviation of 12 years and a range of 31 to 80 years. About half of the participants were over 60 years of age. This pattern is consistent with Type II diabetes which becomes more prevalent later in life. Eleven of the participants were male (40.7%) and sixteen were female (59.3%). Over 80% of the participants were married.

The mean years of education of participants was 14 with a standard deviation of 2.5. The range was from eight years to 19 years with 16 individuals (59%) reporting education beyond high school level and only two with less than high school education.

For nearly 90% of participants, duration of disease was ten years or less (Table 1).
Mean duration was 4.8 years with a standard deviation on 6.4 indicating high variability
among participants.

Table 1.

Duration of Disease in Years as Reported by Participants of the Study

Duration in years	Participants	
	Number	Percent
Less than 1 year	5	19.2
1 to 5 years	14	53.8
6 to 10 years	4	15.5
More than 10 years	3	11.5
Total	26	100.0

Seventeen respondents provided a recent fasting blood glucose value (Table 2).
The Mean value was 138 mg/dL with a standard deviation of 40.7. The range was from
80 to 258 mg/dL.

Table 2.

Self-Reported Fasting Blood Glucose

Blood Glucose in mg/dL	Participants	
	Number	Percent
80 - 110	5	29.4
111 - 150	6	35.3
151 - 200	5	29.4
Over 200	1	5.9
Total	17	100.0

Six participants reported their latest Hgb. A1C. The mean value was 8.2. The range was from 5.7 to 11.0 and the standard deviation was 2.1.

Adherence to the diabetes regimen was measured by the responses to four questions relating to dite, exercise, foot checks and self-monitoring of blood glucose (Table 3). Over 70 percent of the participants indicated adherence to the regimen.

Table 3.

Responses to Questions Indicating Adherence to Diabetes Regimen

Question	Yes	No or No Response
1. Do you follow a diet for your diabetes?	19	8
2. Do you exercise at least three times a week?	19	8
3. Do you check your feet at least once a month?	24	3
4. Do you check your blood sugar at home?	19	8

Eleven participants (41%) reported the presence of complications related to the diabetes disease process. Of these, five reported a single complication and six reported two complications (Table 4). Five reported the presence of retinopathy, seven a change in sensation in the hands or feet due to diabetes, one individual reported sores on her feet or legs that were slow to heal, and four reported changes in kidneys due to diabetes.

Table 4.

The Distribution of Complications by Individual Respondent

Respondent	Retinopathy	Changes in Sensation	Slow Healing Sores	Nephropathy
2	X	X		
3	X			
7			X	
10	X			X
13	X	X		
14		X		
15		X		
18		X		X
20	X			
21		X		X
26		X		X

The Diabetes Self-Efficacy Scale contained 21 items, each with a possible score of one to five (five being the most positive or desirable). A total score was calculated for all items and subscores for four subscales. Maximum possible score for the total scale was 105 points. The mean total score for this sample was 67. The range was 53 to 81 and the standard deviation was 8.2 (Table 5). The diet subscale consisted of eight items (1, 3, 5, 10, 12, 15, 18, 20, 21) with a possible maximum score of 40 points. The mean score for this subscale was 24 with a standard deviation of 4.2. The exercise subscale, consisting of six items (2, 4, 8, 11, 12, 14), had a mean score of 20 with a standard deviation of 4.3. The general subscale contained four items (6, 7, 9, 15) and the mean score was 12 with a standard deviation of 3.4. The medication subscale was completed only by people who take medication specifically for their diabetes (i.e. oral agents or exogenous insulin). This subscale consisted of three items (19, 20, 21) and the mean

score was 7 with a standard deviation of 1.9. See Table 5 for a summary of the scores for

the total scale and the subscales.

Table 5.

<u>Summary of Response Computations for Total DSES and Subscales for Study Sample</u>

	Total Scale	Diet Subscale	Exercise Subscale	General Subscale	Medication Subscale
Number of items in scale	21	8	6	4	3
Maximum possible score	105	40	30	20	15
Number of valid responses	14	23	23	22	18
Mean Score	67	24	20	12	7
Standard Deviation	8.2	4.2	4.3	3.4	1.9
Range	53-81	14-33	8-27	4-19	4-11

The scores for the total scale and the four subscales were computed separately

for the eleven individuals with self-reported complications. When compared with the

scores of the sample as a whole, the complications groups scored lower in all areas of the

scale, meaning less self-efficacy for those in this group (Table 6).

Table 6.

<u>Summary of Response Computations for Total DSES and Subscales for Respondents</u>
<u>With Complications</u>

	Total Scale	Diet Subscale	Exercise Subscale	General Subscale	Medication Subscale
Number of items	21	8	6	4	3
Maximum possible score	105	40	30	20	15
Number of valid responses	7	9	9	8	8
Mean Score	65	22	18	11	8
Standard Deviation	7.9	4.4	4.9	5.1	2.1
Range	54-77	14-28	8-25	4-19	4-10

The lower self-efficacy of the group with complications is further confirmed when scores for the total scale and the four subscales were computed separately for the individuals without self-reported complications (Table 7). When compared with the scores of those with complications, the group without complications scored higher (more self-efficacy) in all categories (Figure 1).

Figure 1. Comparison of DSES Mean Scores on Four Subscales
For Respondents With and Without Complications

Source:Tables 6 and 7
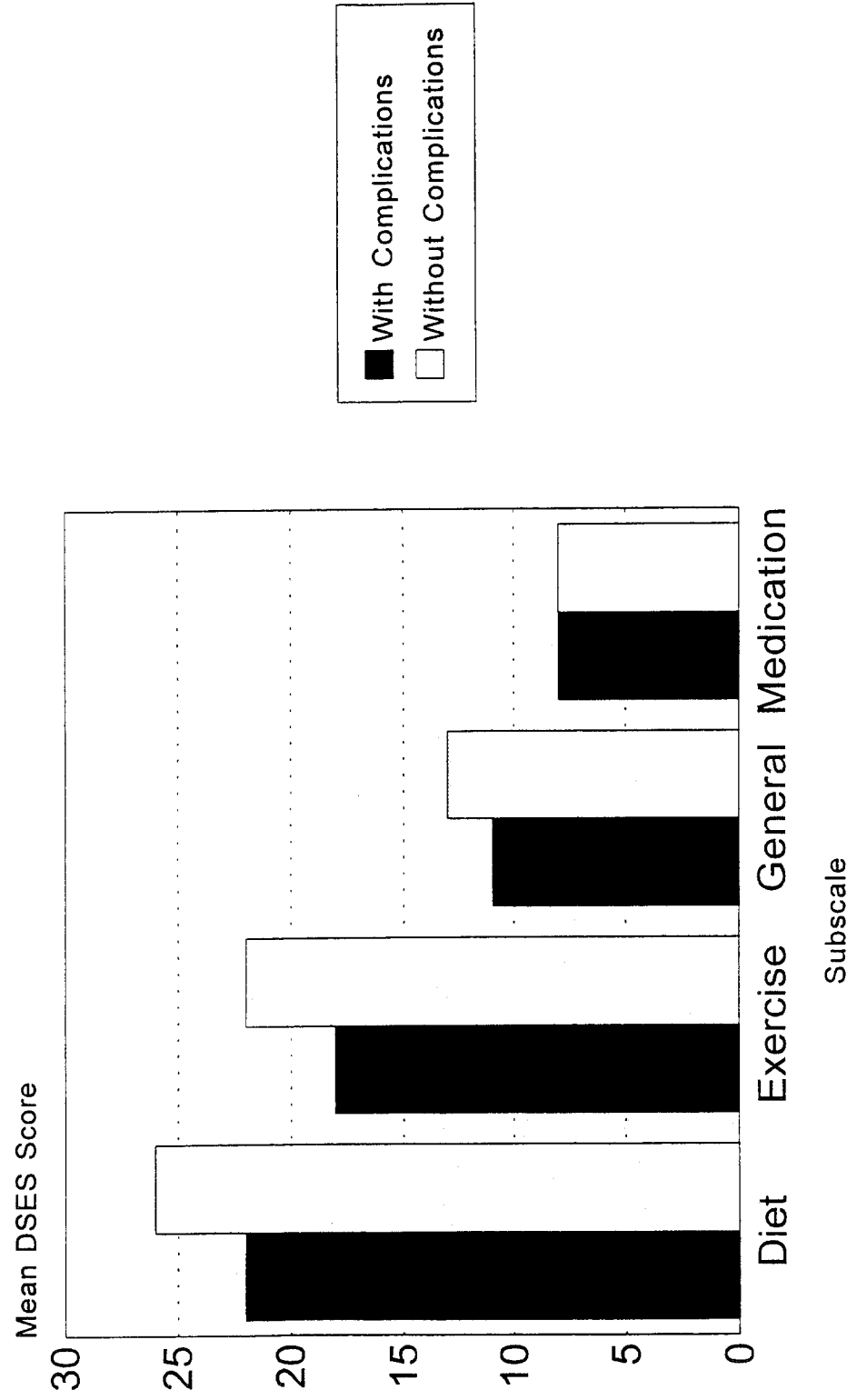
Table 7.

Summary of Response Computations for Total DSES and Subscales for Respondents

Without Complications

	Total Scale	Diet Subscale	Exercise Subscale	General Subscale	Medication Subscale
Number of items	21	8	6	4	3
Maximum possible score	105	40	30	20	15
Number of valid responses	7	14	14	14	10
Mean Score	69	26	22	13	8
Standard Deviation	8.6	3.7	3.0	2.2	1.8
Range	53-81	21-33	16-27	8-16	6-11

The correlation between the total score for the DSES and the self-reported

diabetes regimen adherence behaviors (relating to diet, exercise, monthly foot checks and

self-monitoring of blood glucose) revealed significant $(P < .05)$ inverse relationships

between total score and exercise $(r = .57, P = .03)$ and total score and self-monitoring of

blood glucose $(r = .54, P = .04)$ (Table 8).

Table 8.

Correlation Matrix of DSES Total Score and Self-Reported Adherence to Diabetes
Regimen Behaviors.

	Correlation Coefficients			
	Follow Diet	Exercise 3X/Week	Check Feet Monthly	Monitor Glucose at Home
r	.29	.57	.01	.54
m	12	14	14	14
P*	.37	.03	.96	.04

*Two-Tailed Test

CHAPTER FIVE

The purpose of this study was to describe self-efficacy theory and to examine the relationship between perceived self-efficacy and demographic, disease-related and behavior related regimen variables. Data collection was accomplished through the completion of a questionnaire by study participants of the study. The questionnaire consisted of items which addressed demographics, diabetes regimen adherence behaviors, and information about the presence of diabetes-related complications. The questionnaire also included the Diabetes Self-Efficacy Scale. The questionnaire was distributed to a convenience sample of Type II diabetics who were enrolled in a diabetes education series at a military medical center in the suburban Washington DC area.

Discussion of the Findings

Thirty four individuals were enrolled in the diabetes education classes over the two month data collection period and 27 completed questionnaires were obtained. The number of completed questionnaires was lower than anticipated for the study due to the timing of the data collection period which occurred during January and February. Weather during these months was unpredictable and attendance in the classes was lower than at other times of the year. However, 79% of the individuals who attended classes during the data collection period completed questionnaires and the diabetes education staff must be commended for achieving this excellent response rate.

The fact that this study took place at a military medical center is significant because of the implications for access to care. Participants in the study received medical care, diabetes education, and support services (such as laboratory and pharmacy;

including glucose monitoring supplies) free of charge. Because of their military status, participants received a steady income either in the form of active duty pay or retirement income, and, thus, are faced with minimal financial and physical barriers to care. Also of note was the educational level of the participants: all but two were high school graduates, and 59% had college experience. One individual was doctorally prepared and one reported two master's degrees. Eighty-one percent of the sample were currently married.

The participants of this study enjoy near optimal conditions with regards to caring for their diabetes. As a group, they are well educated and the majority have someone living with them who can theoretically help them with the diabetes management process. They are economically secure and have ready access to medical care and supplies. They have a formal diabetes program available to them directed by an experienced Certified Diabetes Educator. Fifty-two percent of the participants have had at least two years of personal experience with the disease. They are individuals who, by virtue of their military background, are accustomed to a structured lifestyle. Although there was every reason to expect that this sample would be adequately coping with their diabetes the data did not support this expectation. Why is this so?

The answer to this question might lie, in part, in the Diabetes Control and Complications Trial which demonstrated conclusively that near-normalization of blood glucose prevents the onset and progression of complications associated with diabetes. The only difference between the control group and the experimental group in this study was the intensity of their diabetes regimens and the degree of preparation and support

they received to maintain the regimen over a period of several years. The control group received their diabetes education in the traditional manner. They were provided with didactic information in a classroom setting and no provisions were made for individualized instruction or follow-up. In contrast, the experimental group was taught about diabetes care in a number of ways. They received some classroom instruction but the bulk of their knowledge was built in scheduled one-on-one sessions in which the delivery of the material was tailored to meet the needs of the participant. After the initial instruction, regular 15 minute follow-up sessions were scheduled through the duration of the study. During these sessions, the client was encouraged to set the agenda and to prioritize and problem solve according to his or her own needs. The emphasis, throughout the process, was on ensuring that the participant understood the underlying rationale for all aspects of the regimen and could make informed day-to-day self-care decisions.

The relative success of the patient education styles employed by the DCCT are consistent with self-efficacy theory. To review, Bandura (1977) identified four antecedents to self-efficacy: enactive attainment, vicarious experience, verbal persuasion and physiologic state. These four antecedents contribute to self-efficacy beliefs and the behavior and the effects of the behavior follow. The educational experience of the control group was based primarily on verbal persuasion: the process of convincing individuals of their ability to perform a task simply by telling them they can. While verbal persuasion can contribute to successful performance, efficacy expectations produced by verbal persuasion are weaker than those stimulated by performance

accomplishment and vicarious experience. In contrast, the experimental group's educational design drew heavily on performance accomplishment and vicarious experience and utilized verbal persuasion to a lesser degree. Physiologic state, the fourth antecedent, was also a significant factor in the experimental group's educational experience. The majority of their sessions were directed by the participant, rather than the provider, against the backdrop of the participant's personal situation at that time. This was significant because self-efficacy is not static, but increases or decreases depending on the stresses in the participant's life at a given moment.

At the point that data were collected for this study, the educational experience of the military population was very similar to that of the DCCT's control group in that it consisted of classroom instruction based primarily on verbal persuasion with enactive attainment and vicarious experience employed to a much lower degree. Given this situation, it can be anticipated that this group's outcome will also be similar to that of the DCCT control group and they can be expected to continue to progress in disease severity and consequences.

This is the paradox of diabetes education. In the traditional healthcare setting, these programs are not considered an integral part of the disease management process but are viewed as a budgetary drain which can be tolerated in the good years, and eliminated in the bad. In many instances, they are poorly staffed and have no budget of their own, requiring that the programs rely on drug and glucose meter companies for patient education information and supplies. Many of the traditional programs continue to rely on the lecture format as the basis of their information delivery because this is the only way

they can begin to address the needs of the many patients who present for education with the resources available to them. Education programs are under the same constraints in the military healthcare system. This study took place at a major military medical center. The diabetes education staff consisted of one Certified Diabetes Educator and one part-time clerk. While the program is rich in referrals, it is poor in resources. Working four days a week, this educator is responsible for all classroom and individualized patient teaching, for staff development in the area of diabetes and for the diabetes resource group, for data collection and compilation to meet ADA recognition standards and for acting as a resource in issues of patient equipment. There is no dedicated patient teaching area and the program is continually moved based on the physical needs of the medical center. This picture is consistent with the programs in many major medical centers. At smaller facilities, diabetes education is generally considered an individual nurse's additional duty and is provided in his or her spare time. While it is clear that diabetes education services are being provided to patients in the traditional healthcare settings, they can hardly be considered innovative and certainly are not assigned a high priority. Consequently, while these healthcare settings are saving money up front, they are expending considerable sums on the management of the complications of diabetes. If there is any lesson to be learned from this study, it is that diabetes education is not a luxury, but is a necessity. The dollars expended in the management of any single diabetes complication could more than pay for the funding of high quality diabetes education. This is a matter of priorities and common sense. The findings below support this position.

Disease status was measured by three criteria: fasting blood glucose, Hemoglobin A1C, and the presence or absence of complications. Blood glucose monitoring is fundamental to maintaining diabetes control. It is reasonable to expect that people cannot manage a condition such as diabetes if they don't know how their body responds to the disease under everyday circumstances. Despite this fact, only 17 participants (63% of the sample) reported a recent fasting blood glucose value. Of those reporting, seven (41%) reported a fasting glucose of less than 120 mg/dL. This reading represents good control at the time the glucose was monitored. Four additional individuals reported that their fasting blood glucose was less than 150mg/dL. This does not represent good control but is considered an acceptable reading if it occurs from time to time. Six respondents (35%) reported fasting blood glucoses of greater than 150 mg/dL, indicating poor control.

Hemoglobin A1C is the "gold standard" of diabetes care and its value is emphasized in the patients' diabetes education. They are instructed in the significance of the test and are told of the importance of tracking this value. All participants had a current Hgb A1C and, theoretically, should have been able to provide the value when asked. Unfortunately, only six participants (22%) were able to do so. Of the values that were reported, two (5.7, 6.6) fell within the "good control" range, two (7.4, 8.0) were acceptable, and two (10.4, 11.0) were poor.

The final criterion of disease status was the presence or absence of diabetes related complications. As was noted previously, these complications arise largely as a result of inadequate blood glucose control and have been demonstrated to be largely

preventable. In this sample, eleven individuals (41%) reported that they have complications that are directly related to diabetes. Five had a single complication and six reported multiple complications. The presence of complications makes diabetes management significantly more complex. For example, five individuals reported that they have developed retinopathy, a leading cause of blindness. A significant portion of the diabetes regimen requires visual acuity and is compromised by poor eyesight. The DCCT demonstrated that progression of retinopathy could be slowed or halted with good glycemic control. The prospect of preserving function, along with cost-saving benefits of avoiding treatments such as laser surgery, should certainly provide strong argument for intensifying efforts to correct inadequate diabetes management. In the case of this sample, the resources are in place but measures must be taken to bring the participants on board as well by increasing their adherence to the regimen.

Diabetes regimen adherence represents the participants' involvement in the management of their diabetes. Because the bulk of the decision making takes place at home, diabetes self-care is essential. Regimen adherence was measured by the responses to four questions:

1. Do you follow a diet for your diabetes?

2. Do you exercise at least three times a week?

3. Do you check your feet at least once a month?

4. Do you check your blood sugar at home?

Responses to these questions were surprisingly positive. Seventy-nine percent reported that they followed a diet and 73% said they exercised at least three times a week. Eighty

eight percent claimed to check their feet at least monthly. Finally, 70% stated that they checked their blood sugar at home. On the face of it, these responses are positive but there is reason to be skeptical. First, they are not consistent with the information reported for disease status. The DCCT has demonstrated that good control results from taking measures to optimize blood glucose levels and that, in most cases, good control results in a decreased onset of complications. It stands to reason that individuals who manage their diabetes regimen well would report fasting blood glucose and Hgb A1C levels in the good to acceptable range and would, overall, exhibit minimal complications. In this sample, this is not the case. While 19 individuals reported that they checked their blood glucose at home, only 17 were able to provide a value when asked. While all were instructed in the significance of Hgb A1C values, only six could actually state a recent test value. Finally, 41% of the sample reported the presence of disease related complications.

Secondly, the pattern of the responses is questionable. Diabetes management activities tend to fall into two categories: lifestyle intensive and technical. Lifestyle intensive activities, such as diet and exercise, tend to be the most difficult to maintain due to their near-global intrusion into established personal and social patterns. Technical activities, such as medication taking, glucose monitoring or foot checks, tend to be somewhat easier to maintain and, while not pleasant, require little lifestyle adjustment. In this sample, a higher percentage of people reported adherence to diet and exercise than to glucose management. While it is possible that the participants perceived that they were more adherent in the diet and exercise realms, it is unlikely that these responses are

valid. For one thing, the disease severity indicators do not support a high level of adherence in diet and exercise. Secondly, the investigator's personal observations have been that individuals tend to provide more realistic self-assessments about concrete behaviors such as medication management and glucose monitoring, and tend to generalize dietary intake. Had the participants been asked more specific questions about adherence activities, as opposed to simple yes-no questions, the outcome would probably have been more consistent with what was expected based on the disease status findings.

The responses of this sample to the Diabetes Self-Efficacy Scale were interesting for several reasons. The sample's mean score for the total scale (67.3, SD = 8.2) was very similar to that of the Zagreb sample (mean 69.4, SD = 13.5) studied by Padgett (1991) although her sample was larger (147 participants), and considerably less educated. In terms of age, gender, marital status, and clinic composition, however, the two samples were very similar. Padgett does not mention whether her study sample was required to pay for any services, but she does state that the clinic was administered by the World Health Organization so it might be assumed that fees were minimal. Unfortunately, the subscales for these two samples could not be compared because they were scored differently and information was not available regarding Padgett's calculations of her scores.

When the individuals without complications were compared to the complications subsample, the latter scored consistently lower in all categories, indicating lower self-efficacy among those with complications. The mean total DSES score for the sample without complications was 69.1 (SD = 8.6) while the complications subsample scored

65.4 (SD = 7.9). The subscale scores were as follows (no complications/with complications): diet (25.9/22.3, maximum possible score 40), exercise (22.4/18.2, maximum possible score 30), general (12.9/11.9, maximum possible score 20), and medication (8.0/7.7, maximum possible score 15). The closest scores were in the medication subscale which is to be expected as the majority of people taking medications also reported complications. The difference in scores in all subscales is consistently lower at about the same rate. While the difference in scores is not large, it represents a trend that indicates that the people with complications do not feel as confident about their ability to manage their disease as those without complications. The overall picture presented by the DSES scores is disappointing but appears to be consistent with Self-Efficacy Theory. Despite the many resources available to them, the sample can be said to be performing at a sub-optimal level and the DSES scores reflect a consistent sense of lack of mastery over the disease management process. The probable reasons for their low self-efficacy and the consequent outcomes have been discussed previously. It is the investigator's belief that these findings could be improved under the circumstances described above.

<div align="center">Research Questions</div>

The research questions guiding this study were as follows:

1. What is the overall self-efficacy of the population addressed in this study?

The overall self-efficacy of this study population was found to be consistent with a similar group using the same scale. Further, the self-efficacy appeared to be consistent with the disease status of this group. Both variables were sub-optimal given the apparent

support and resources available to the sample, but it is clear that these resources have not adequately met the needs of this sample. The findings underscore the importance of providing an ongoing, individualized diabetes education process that addresses the cognitive and psychological needs of the clientele. Although the pieces of the diabetes management process were in place, the disease status of the sample reflected a picture of group that was not applying the principles they had been taught.

2. What is the relationship between self-efficacy and demographic factors such as age, sex, marital status and education?

3. What is the relationship between self-efficacy and disease related factors such as duration of disease, self-reported presence of complications?

4. What is the realtionship between self-efficacy and blood glucose levels using diagnostic tests such as Hemoglobin A1C or a current fasting blood sugar?

5. What is the relationship between self-efficacy and behavior-dependent aspects of regimen adherence such as diet, exercise, medication and general management of diabetes?

This study did not definitively answer questions two through four due to small sample size and instrument design defects. The instrument relied too heavily on self-reported information and did not collect enough information about adherence behaviors to make meaningful inferences. The correlation between the DSES and the adherence behaviors of exercise and glucose monitoring were shown to be significant but these findings are suspect for reasons discussed previously. A previous study revealed a significant relationship between the diet subscale and depressive symptoms but the

investigator was unable to explain it. That study also showed that persons with higher levels of self-efficacy tended to rate themselves as more adherent to the diabetic regimen and the investigator concluded that measuring the variables concurrently in some way influenced respondents' answers (Padgett, 1991). That phenomenon might account for the high percentage of positive responses to the adherence questions and underscores the need for more specific and detailed responses from the participants.

<div align="center">Conclusions and Recommendations</div>

The results of this study underscore the importance for continued support of diabetes education efforts and the need for further study about how they can become more effective. The participants in this sample have been provided with diabetes care and education under optimal conditions, but they have not internalized the information to a degree that will reduce the anticipated progression of complications among the sample. This points to the need for further study of interventions that influence motivation on the part of the diabetes population. What effect do learning styles have and how should education programs be designed to meet the needs of people who respond to information in different ways? How can additional behavior modification techniques be employed to optimize diabetes self-care? How should the needs of the diabetic's support system be addressed? How should information be reinforced, by whom, and how often? What is the role of the primary care provider in the education process and what are his or her educational needs? What is the role of the traditional classroom setting and when is individualized instruction appropriate? What is the optimal staffing mix for education programs and how can they be funded? How will the implementation of these programs

affect resources currently expended on treatment of complications? What is the role of media in diabetes education? The answers to these questions and more will lead to increased effectiveness in diabetes education and will bring about a more involved diabetic client. Diabetes education programs are expensive but the consequences of neglect are even more so.

The descriptive findings of this study supported previous research. The role of self-efficacy theory in diabetes education should be pursued. Based on her experience in conducting this study, the investigator strongly recommends that the following changes in methodology be employed in any future studies in this area. The DSES proved to be a useful instrument in measuring self-efficacy, but should be expanded to reflect findings which have occurred since its development in the mid-1980s. Information about regimen adherence should be collected in a manner that is independent of the administration of the DSES to minimize any influence one instrument has on the other. Information about adherence should be elicited in more than one way, perhaps by self-report and observation, or prior and following an intervention so less reliance is placed on the participant's perception of his or her adherence behaviors and more on the actual outcome of those behaviors. Finally, disease status should be assessed in an objective manner through chart checks for fasting blood sugar and Hgb A1C and/or by downloading the memory of the participants' glucose meter. This information should be used in conjunction with a healthcare provider's assessment of complication status. Finally, every effort should be made to increase the number of participants in the study significantly. Obviously, implementation of these recommendations would require a

greater investment in time and resources than was available to this investigator, but it is believed that the effort would result in valuable information and it should be pursued.

The significance of Self-Efficacy Theory goes beyond the diabetes education program. Every member of the diabetes team has an opportunity to bolster self-efficacy at each point of interaction with the patient and should be aware of their responsibility to do so. Attention should also be directed at the family members and support system of the diabetic patient and means to maximize their role should be investigated.

Summary

The purpose of this study was to describe Self-Efficacy Theory and to examine its role in the diabetes education process. Findings suggest that self-efficacy has a role in the education process and future studies should focus on how self-efficacy can be enhanced to optimize diabetes regimen adherence. The findings extend beyond the diabetes education setting with implications for the clinical practice of all members of the diabetes team.

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APPENDICES

Appendix A: Questionnaire

Appendix B: Permission to use Diabetes Self-Efficacy Scale

Appendix C: Approval to Distribute Questionnaire

Appendix A

Questionnaire

1. Active Duty _____ Retired _____ Dependent _____
2. Age _____
3. Male _____ Female _____
4. Number of years of education _____
5. Marital Status: _____married _____never married _____separated
   _____divorced _____widowed
6. Duration of Diabetes: Year of diagnosis _____
7. Complications of Diabetes: Please check any of the following that apply
   _____ vision changes related to diabetes (retinopathy)
   _____ changes in sensation in your hands or feet due to diabetes
   _____ sores on your feet or legs that are slow to heal
   _____ changes in your kidneys due to diabetes
8. What was your most recent fasting blood sugar? _____
   What was your most recent Hemoglobin A1C? _____
9. Do you follow a diet for your diabetes _____yes _____no
10. Do you exercise at least three times a week _____yes _____no
11. Do you check your feet at least once a month _____yes _____no
12. Do you check your blood sugar at home _____yes _____no

For each of the following questions, please circle the number that most closely reflects your answer using the following scale:

Strongly agree	agree	neither	disagree	strongly disagree
1	2	3	4	5

1. Following a diabetic diet is very difficult for me

2. I can't exercise because I don't know how much exercise is safe for me

3. I have trouble staying on my diabetic diet on holidays, birthdays and special

   occasions.

4. I can't get myself to exercise in bad weather.

5. When I go to parties, I can stay on my diabetic diet.

6. I have trouble taking care of my diabetes.

7. I can't manage my diabetes in new situations.

8. Exercising regularly is too difficult for me.

9. My diabetes constantly defeats me.

10. I am able to stay on my diabetic diet while on vacations.

11. I have trouble finding ways to add exercise to my daily routine.

12. I can adjust my diet to prevent low blood sugar reactions when I exercise.

13. The diabetic diet is too confusing for me to follow.

14. I can't exercise because I worry about having a low blood sugar reaction because of my diabetes.

15. I have the skills necessary to take care of my diabetes.

16. It's difficult for me to stay on my diabetic diet around people who are not aware I'm diabetic.

17. I can't stay on my diabetic diet when I eat out.

18. I can adjust my diabetic diet when I get sick.

If you are taking medication <u>for your diabetes</u>, please answer the following:

19. I occasionally skip a meal after I take my diabetes medication.

20. I always remember to take my diabetes medication.

21. I can tell you the name and dosage of my diabetes medication.

Appendix B: Permission to Use Diabetes Self-Efficacy Scale

OREGON HEALTH
SCIENCES UNIVERSITY

3181 S.W. Sam Jackson Park Road, Portland, Oregon 97201-3098

Community Health Care Systems Cluster
(503) 494-7709
(503) 494-4678 (fax)
Mail Code: SN CHC

School of Nursing

Primary Health Care Cluster
(503) 494-3842
(503) 494-3878 (fax)
Mail Code: SN FAM

March 11, 1997

Kathleen French
4283-2 Wilmington
Andrews Air Force Base, MD 20762

Dear Ms. French:

Thank you for your interest in the Diabetes Self-Efficacy Scale that I developed in 1986 as part of my doctoral dissertation work at the University of California, San Francisco.

Yes, you have my permission to use the Diabetes Self-Efficacy Scale (DSES), a copyrighted 25 item tool. Please be sure to acknowledge the source of the tool in all administrations, presentations and publications. I have enclosed a copy of the tool and information regarding its scoring. I am sending you the tool by mail so it can be photocopied.

I look forward to hearing from you about the results of your study when it becomes available. Please send me an abstract once the study is complete. As you recall, I am also interested in your description of how well the tool worked in your study. I am trying to maintain a users' network. I'd like to pass along information to future users regarding the strengths and weaknesses of the DSES as it is used for different purposes.

You can reach me at the above address or by phone (503) 494-3828 (voice mail/office) or fax me at (503) 494-3878.

Cordially,

M. Katherine Crabtree, DNSc.
Associate Professor

Appendix C: Approval to Distribute Questionnaire

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 89TH AIRLIFT WING (AMC)

19 Nov 96

MEMORANDUM FOR CAPTAIN KATHLEEN FRENCH
4283-2 WILMINGTON DRIVE
ANDREWS AFB MD 20762-6600

FROM: 89 MDG/SGI
1050 W. PERIMETER RD STE JB
ANDREWS AFB MD 20762-6600

SUBJ: Approval to Collect Data

Approval is granted for you to distribute a self-administered questionnaire in support of your
thesis: "Self-Efficacy as a Predictor of Regimen Adherence in Self-Care on Non-Insulin
Dependent Diabetes Mellitus". An informed consent document is not required as the subject
may elect to not complete the questionnaire.

ISADORE NEUROCK. DDS
Director of Medical Education

AMC--GLOBAL REACH FOR AMERICA